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AN ABSTRACT

OF

WHATELY'S LOGIC.

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AN ABSTRACT

OF

WHATELY'S LOGIC,

TO THE END OF CHAPTER 3, BOOK 2;

WITH EXAMINATION PAPERS;

FOR THE USE OF STUDENTS.

BY

BION REYNOLDS, B.A. (M.A., LOND.),
SCHOLAR OF ST. JOHN'S COLLEGE, CAMBRIDGE.

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PRELIMINARY EXPLANATION OF A FEW OF THE COMMONEST EXPRESSIONS USED IN LOGIC.

THE following is an example of a syllogism:

All men are mortal;
John is a man;
Therefore John is mortal.

Each of these three statements is a "proposition." Every proposition has two "terms," viz. a "subject," or the thing spoken of, and a "predicate," or the thing that is affirmed of the subject. These two terms are connected by a "copula." Thus in the proposition, "All men are mortal," the terms are "all men" and "mortal," the former being the subject, the latter the predicate, and the copula is "are."

Thus a syllogism contains three propositions and three terms (each of these terms occurring twice). The first two propositions are called the "premisses," and the third the "conclusion." The term which occurs in each of the premisses is called the "middle-term," as being the medium of proof.

The conclusion is seen to be derived from the two premisses by eliminating from them the middle-term.

Note. The most important part of the subject is contained in Book 2, and especially in Chapter 3.

INTRODUCTION.

Logic is a science of the necessary laws of thought. Instituting an analysis of the process of the mind in reasoning, it is in this point of view strictly a Science; but, hence furnishing rules for guarding against erroneous deductions, it may also be considered an Art. For, a science is conversant about speculative knowledge only; an art is the application of knowledge to practice.*

The progress of Logic has been slow, owing to its not having been cultivated on right principles, its province having been repeatedly extended to subjects with which it has no proper connexion. Indeed, before the time of Aristotle no distinction was drawn between Logic and Metaphysics.

It is not necessary to be thoroughly conversant with the history of Logic in order to understand the science itself. Old theories should be valued only by their intrinsic importance, and there is no reason why each technical term should retain for ever the meaning originally attached to it.

Zeno the Eleatic (born 488 B.C.) was the earliest systematic writer on Dialectics. He introduced the interrogatory method of disputation (ἐρώτησις), which Socrates adopted, and which has since borne his name. Zeno also wrote a treatise on the sophistical wrangling method (ἐριστική), which was much in vogue among the Greeks, but which should be looked upon rather as one of their intellectual recreations than as a serious study.

To Zeno succeeded Euclid of Megara, and Antisthenes—both pupils of Socrates.

To Archytas we are indebted for the doctrines of the Categories.

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* Sir W. Hamilton severely criticizes this opening paragraph, in particular objecting to the definitions of a science and an art. He defines Logic as "the science of the laws of thought as thought."

Aristotle (born at Stagira, 384 B.C.) rightly claimed to have laid the foundations of the system, which remains fundamentally the same as he left it, though it has been often complicated and distorted by subsequent writers. The logical system is one of those few theories which have been begun and completed by the same individual. Yet the works of Aristotle were comparatively lost to the world till about the year 500 A.D., when they were translated into Latin by Boethius.

Galen added the fourth Figure.

The Schoolmen devoted much attention to Logic, and wasted much ingenuity upon it, utterly mistaking its real nature and object. Their errors may serve to account for the strong terms in which Bacon sometimes appears to censure logical pursuits.

Locke, too, severly censures the science, as being unserviceable for the *discovery* of truth. He undervalues and mistakes the scope of Aristotle's labours, saying in one place that "God has given men a mind that can reason without being instructed in methods of syllogizing."

Watts craved after the attainment of some all-powerful and comprehensive system, which he attempted to construct under the title of *The right use of Reason.* This was to be a method of invigorating and properly directing all the powers of the mind—an achievement not only beyond the province of Logic, but which could not be accomplished by any *one* science or system whatever.

Later writers have erroneously supposed the Syllogistic to be a *peculiar* method of reasoning, instead of being a method of analyzing the mental process which *invariably* takes place in all correct reasoning. Their mistake is as if one should regard Grammar as a peculiar Language, and should contend against its utility on the ground that many speak correctly who have never studied the principles of grammar.

Logic is a *test,* whereby, as in chemical analysis, we examine the elements of a compound structure, in order to detect any latent sophistication.

Some objectors maintain that men often reason from a single premiss, without any other being expressed or understood. But in these cases it will be found either that the conclusion is already contained in the premiss,* or that there really is another premiss suppressed, upon the existence of which the validity of the argument depends.

Some deny that the conclusion is *inferred* from the universal premiss; yet they acknowledge the latter to be an indispensable *condition* of such inference, which comes to much the same thing. If a man should deny that the branches of a tree derive nourishment from the roots, saying that they derive it from the juices of the earth, but at the same time admitting that the roots are an indispensable condition for the life of the branches, no one would care to contradict him.

Again, in inferences by induction, which are sometimes spoken of as not being substantially syllogistic, the apparently missing premiss is really "that the instances adduced are *sufficient* to warrant the inference."

Complaints have been made that Logic leaves untouched the sources of the chief errors in reasoning, such as the indistinctness of terms or the degrees of evidence in various propositions. But to find fault with Logic for this is as unreasonable as to expect that a reading-glass should be able to *teach* a man to read.

The real province of Logic is the process of Reasoning itself, not the *subject-matter* about which it is employed. So in the science of Arithmetic, we do not inquire whether the data are correct from which we calculate, nor trouble ourselves about the concrete things which the numbers must refer to.

Some, again, censure Logic for being wholly conversant about Language, or words, taking for granted that Reasoning may be carried on altogether independently of Language. That this is not the case is shewn by the fact that a deaf-mute, before he has been taught some sort of language, cannot carry on a train of Reasoning any more than a brute.

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* Immediate Inference; see Thomson's "Laws of Thought."

A difficulty attending the study of Logic, in common with all abstract pursuits, arises from one's inability to see the drift and intention of it before the most laborious part of the work is over. To partly obviate this difficulty, Whately first gives a slight sketch of the logical system according to the analytical mode of procedure, a mode more natural, thought not so methodical, as the synthetical. In the synthetical method, we begin by defining and investigating the nature of the *terms* of which propositions are composed; we then consider the proposition, and finally the whole syllogism. Analytically, we begin with the last, and resolve it step by step into its simple elements.

BOOK I.

ANALYTICAL OUTLINE OF THE SCIENCE.

§ 1.

WHEN we *reason*, in the strict sense of the word, *i.e.* make use of *real*, *valid* arguments, a certain process takes place in the mind which is one and the same in all cases.

The mind, it is true, is usually unconscious of this process, nor could explain it. Practice must have preceded theory, in this science as in others; thus Language came before Grammar, and Music before Counterpoint. This consideration serves to expose the futility of the popular objection against Logic, that men may reason well who know nothing of it; for the same objection might be applied in many other cases, where its absurdity would be obvious.

We must keep in mind the *sameness* of the reasoning process in all cases, whether applied to Mathematics, Theology, Metaphysics, or Politics. As a parallel case, the multiplication of a number by 10 is the very same process, whether the number denote men, miles, or pounds.

As was remarked in the Introduction, Logic is not a *peculiar method* of reasoning, but a method of unfolding and analyzing our reasoning; Logic is not *an* art of reasoning, but *the* art of reasoning. The logician lays down rules, not by which one *may* reason, but by which everyone *must* reason.

§ 2.

To analyze the operations of the mind in reasoning would be an interesting matter of inquiry, even if it were of no practical use. But the laying down of general rules of reasoning applicable to all cases must clearly be of great service in detecting and exposing the fallacies (*i.e.* unsound arguments) so often either purposely or ignorantly employed in discussion. Such fixed and acknowledged principles of reasoning would be analogous to the rules of Arithmetic, which obviate the tediousness and uncertainty of calculations in the head, wherein different persons might arrive at different results, without any of them being able distinctly to point out the error of the rest. A system of such rules, it is obvious, should be called, not the "art of wrangling," but the "art of cutting short wrangling," by bringing the parties to issue at once.

To commence now our analysis of argument, it will be found that every *conclusion* is deduced, in reality, from two other *propositions* (thence called *premisses)*, though one of these may be often suppressed. The actual existence of the suppressed premiss may be made evident by supposing its *denial*, which will at once invalidate the argument.

Thus the argument

"The world exhibits marks of design,
Therefore it must have had an intelligent author,"

is invalidated by a denial of the suppressed premiss, "Whatever exhibits marks of design must have had an intelligent author."

(Some choose to call this latent premiss a *condition*, as was remarked in the Introduction. This, however, is, substantially, just what logicians mean).

An argument thus stated regularly and at full length is called a Syllogism; which therefore is not a peculiar *kind of argument*, but only a peculiar *form of expression* of an argument.

When one premiss is suppressed, the argument is called an *Enthymeme;* to which class, therefore, belongs the example just given. In arguments of this sort, opponents raise objection, as they say, either to the *assertion* itself or else to its *force* as an argument; that is, either to the *expressed* or the *suppressed* premiss.

When a premiss is placed after its conclusion, it is called the *reason* of it, and is necessarily preceded by some *causal* conjunction, such as "since," "because," &c. These conjunctions *may* also precede a premiss when it comes first, and in this order of the propositions the conclusion must be preceded by an *illative* conjunction, such as "therefore."

Thus we see that these conjunctions, "because," "therefore," denote the premiss and conclusion respectively of an enthymeme; that is, they denote respectively the *cause* of our knowledge, and the *effect, i.e.* the knowledge itself.

But the same conjunctions are frequently used to denote the actual *cause* and *effect*, as shewn in the following sentences:

> "The trees flourish *because* the soil is rich."
> "The soil is rich; *therefore* the trees flourish."

The conjunctions are employed in the former sense in the following sentences:

"The trees are flourishing; *therefore* the soil must be rich."
"(I know) the soil is rich, *because* the trees flourish."

In many cases, however, the two significations coincide; especially in arguments relating to future events, where the *cause* is employed to predict the *effect*. Thus, when a man argues from the favourable weather that the crops are likely to be abundant, the actual cause is also the cause of his foreknowledge. And this contributes to the two significations being so often confounded together in other cases.

§ 3.

The conclusiveness or validity of a perfect argument is not impaired in any way by the fact that one or both of the premisses are absurd or untrue. Thus the following argument is perfectly valid:

"All the Ape-tribe are originally descended from Reptiles;
Mankind are of the Ape-tribe;
Therefore Mankind are originally descended from Reptiles."

On the other hand, an argument may be inconclusive, although both the premisses are strictly true. If in this case the conclusion also is true, or plausible, the unsoundness can with difficulty be detected by the unskilful. For example,

"Every rational agent is accountable;
Brutes are not rational agents;
Therefore they are not accountable."

This exactly corresponds in form to the following argument, which is manifestly unsound:

"Every horse is an animal;
Sheep are not horses;
Therefore they are not animals."

In any valid argument we may substitute arbitrary symbols for one, two, or all three of the *terms*, without in the least destroying its validity. Thus, in the valid syllogism,

"Every animal with horns on the head is ruminant;
The elk has horns on the head;
Therefore the elk is ruminant;"

let us put X for "animal with horns on the head," Y for "ruminant," and Z for "the elk;" we then get the equally valid syllogism,

"Every X is Y;
Z is X;
Therefore Z is Y."

A person may understand an *argument*, though he may have a very indistinct notion of one or more of the *terms* introduced; because he can follow the *train of reasoning*. It appears then that valid reasoning, when regularly expressed, has its validity made evident from the mere form of the expression itself.

In the preceding syllogism it is assumed that Y may be affirmed of the whole class of things which X denotes, and next that Z is comprehended in this class. And it is evident that what is said of the whole of a class may be said of any constituent part of it; thus we are authorized to say that Z is Y.

So when anything is *denied* of a whole class, we are authorized to deny the same of any portion or member of that class.

By "class" throughout this treatise is intended a *Head* or *general description*, to which several things, not merely are actually referred, but may conceivably be referred; that is, the class may be *actual* or may be only *potential;* we refer something to a certain class in consequence of its possessing certain attributes, not caring whether other representatives of the class actually exist or no.

All valid arguments whatever may be reduced to such a form as that of the foregoing syllogisms; and consequently the principle on which they are constructed is the UNIVERSAL PRINCIPLE of Reasoning.

Our ordinary mode of expression is very elliptical, many premisses or even whole steps of argument being omitted. It is a mistake to suppose that Aristotle, or other logicians, ever thought that "logical reasoning" requires us to unfold the chain of arguments into a perfect set of syllogisms. The method of analysis is to be employed only at particular points where sophistication is suspected. A fallacy may aptly be compared to some adulterated compound, in which the falsehood is so intimately blended with the truth that it is (to use a chemical phrase) *held in solution;* one drop of sound logic is the test which precipitates it to the bottom.

§4.

Aristotle's "*Dictum de omni et nullo*," the keystone of his whole logical system, is the following maxim: "Whatever is predicated (*i.e.* affirmed or denied) universally of any class of things, may be predicated in like manner of anything contained in that class."

This *Dictum* is not meant to add to the force of any individual syllogism, but points out the general principle on which that process, which takes place in every syllogism, is conducted. It is, in fact, a statement of what argument in the abstract is.

The *Dictum* may be made more exactly correspondent to the syllogistic division by being stated as follows:

1. Anything whatever, predicated of a whole class,
2. Under which class something else is contained,
3. May be predicated of that which is so contained.

The advantages of employing non-significant symbols for the terms of a syllogism are that we thereby secure *generality*, and at the same time avoid *prolixity*, *ambiguity*, *difficulty*, and *prejudice*. The reasoning is then considered by itself, without any risk of our being led aside by the truth or falsity of the conclusion; the essential point in the argument being the *connexion between* the premisses and the conclusion.

We may thus define a syllogism as a valid argument, so stated that its conclusiveness is evident from the mere form of the expression. To remind one that so and so is referable to such and such a class, and that this class comprehends such and such things, is *precisely all that is ever accomplished by reasoning*.

The fallaciousness of an unsound, or *apparent*, argument becomes more palpable when it is stated as nearly as possible in the form of the *dictum*. The fallacy of Mr. Hume's argument against miracles rests in the omission of the word "some" before the words "testimony is more likely to be false than a miracle to be true."

§ 5.

The fallacy in the argument just alluded to consists in the "non-distribution of the middle term." A term is said to be *distributed* when it comprehends all the objects to which it is applicable.

In the syllogism,

> "Food is necessary to life;
> Corn is food;
> Therefore corn is necessary to life;"

the term "food" in the first premiss is not distributed, as it merely means "some sort of food," not "every food." So in the second premiss we see that the same term "food" is again undistributed, for it is only true that "corn is *some* food."

We have no surety that the two portions of the class "food" here alluded to coincide, and can therefore draw no conclusion. Hence we see that the Middle-term, for a valid argument, must be distributed in at least one premiss.

When the words "all," "some," &c., which mark the distribution or non-distribution of a term are not explicitly expressed, but left to be supplied by the general sense of the context, the proposition is termed "indefinite."

Quantity and Quality of Propositions.

Propositions in which the subject is distributed are called Universal (*e.g.* "All men are animals"). Propositions in which the subject is undistributed are called Particular (*e.g.* "Some men are handsome").

This division of propositions is said to be according to their "quantity."

But the predicate is never accompanied by words expressive of extent of distribution, this latter being completely determined by the "quality" of the proposition, *i.e.* by its being *affirmative* or *negative.*

For, when the predicate is *denied* of the subject, this implies that *no part whatever* of the predicate is applicable to the subject, or that *every part* is inapplicable; that is, the predicate is necessarily distributed in negative propositions.

Thus, "No Englishman is uncivilized" is only another way of stating that "No uncivilized man is an Englishman."

But in an affirmative proposition the predicate is not distributed. For, even if the predicate should sometimes *happen* to be distributed in an affirmative proposition, as in the sentence "All men are rational animals," yet this *is not implied by the form* of the expression.

To say that "All equilateral triangles, and no others, are equiangular" (so as artificially to distribute the predicate) is to make two distinct propositions, not one.

Terms which are thus co-extensive with each other are called *convertible* terms. But to affirm one thing of another, and then imply that these terms are convertible, is to make two assertions.*

From these considerations we see that the middle-term must not occur as predicate in both premisses, unless one be negative. Thus, the following argument is correct:

> "No ruminant animals are *predacious;*
> The lion is *predacious;*
> Therefore the lion is not ruminant."

For this may be brought exactly into the form prescribed by the *Dictum* by stating the first premiss thus:

> "No predacious animals are ruminant."

Every sound argument can be reduced into this form, though not always by so short and simple an alteration as in the case before us.

§ 6.

On Abstraction and Generalization.

A "Singular-term" is that which denotes a single individual, and which cannot therefore be affirmed of anything besides that individual; as "Cæsar," "the Thames," &c.

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* Later logicians here disagree with Whately. See foot-note, p. 19.

A "Common-term" is that which denotes any individual out of a whole class, as "a river," "a conqueror," &c. Common-terms are also called "Predicables," because they can be affirmatively predicated of all the objects belonging to their class; a singular-term can be affirmatively predicated only of itself. In other words, a common-term may be either subject or predicate of any proposition, a singular-term can serve as predicate in negative propositions only, as "Isaac's first-born was not Jacob."

The notions expressed by common-terms are arrived at by the mental processes of Abstraction and Generalization.*

When we *draw off* and *contemplate separately* any part, or quality, of an object presented to the mind, disregarding the rest of it, we are said to *abstract* that part. This process is called *abstraction*.†

When we further notice that this part exists in various other bodies, and, disregarding their mutual differences, give them all a common name in respect of this agreement, we are said to generalize. This process is called Generalization. The notion implied by a common-term is an inadequate (incomplete) notion of an individual, and it is the very fact of this inadequacy which allows it to be applied equally well to any one of an indefinite number of individuals.

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* Dr. Thomson, in his "Laws of Thought," p. 75, divides *Abstraction* into five distinct mental processes. (1) *Comparison* is the act of putting together two or more objects to ascertain how far they resemble each other. (2) *Reflection* is ascertainment of their points of resemblance and of difference. (3) *Abstraction* is the separation of the points of agreement from those of difference, that they may form a new nature, different from, yet including, the single objects. (4) *Generalization* is the recognition of a class of things, each of which is found to possess the abstracted marks. (5) *Denomination* is the imposition of a name that shall serve to recall equally the Genus or Class, and the Common Nature.

† It will be noticed that Whately here assumes that by contemplating a *single* object it would be possible to form a conception of its separate qualities, while Dr. Thomson, with probably greater correctness, considers that no observer could abstract any quality except by a comparison of at least *two* objects possessed of such quality. "There cannot be Abstraction without Generalization."

Generalization, it is plain, may be indefinitely extended by further abstractions applied to a set of common-terms, by which *higher* and *wider* common-terms are produced. Thus, from Socrates (a singular-term) we may by successive abstractions arrive at the common-terms "philosopher," "man," "animal," "material being," &c.

[The want of the abstractive faculty, such as that required for the conception of numbers, is a characteristic of savages and of brutes.]

We are able to fix arbitrarily upon any one part of an object that we please, to the disregard of other parts. Thus, we may classify men according to their trades, religions, colour, nationalities, &c.

Men are often disposed to think of an object as properly belonging to some one class alone—a habit which constitutes narrowness of mind.

Thus, a farmer would rank clover as a grass, to the horror of a botanist, while the botanist would equally horrify the farmer by calling couch-grass a kind of wheat. So a diamond would be looked upon merely as a form of carbon by the chemist. Since Reasoning, then, consists in the power of referring the subject we are speaking of to some class (or middle-term), it is important that we should be able correctly, clearly, and promptly, to *abstract* from the subject that which may furnish an appropriate middle-term.

A technical term, if thoroughly understood, is (like other common-terms) of great assistance in any study, inasmuch as it represents a complex idea in a simple symbolical shape, thus obviating the necessity for an elaborate description every time the term has to be employed.

BOOK II.

SYNTHETICAL COMPENDIUM.

CHAPTER I.

Of the Operations of the Mind and of Terms.

§ 1.

THERE are three operations (or states) of the mind which are immediately concerned in Argument, viz.:

1. Simple-apprehension, or the receiving of notions by the mind (which is analogous to perception by the senses). This is either Incomplex, when one or more notions are received, without any relation being perceived between them, as "man," "horse," &c.; or Complex, when some relation is perceived, as of "a man on horseback," &c.*
2. Judgment, or the comparing together in the mind of two of the notions, and pronouncing whether they *agree* or *disagree* with each other. This is, therefore, either affirmative or negative.
3. Reasoning, or the act of proceeding from certain judgments to others founded upon them.

§ 2.

Language affords the *signs* by which these operations of the mind are not only expressed and communicated to others, but even, for the most part, carried on by ourselves. The notion obtained by an act of *apprehension*, when expressed in language, is called a *term;* an act of *judgment* is expressed in language by a *proposition;* and an act of *reasoning* by an *argument* (which, when regularly expressed, is a syllogism).

Logic is *entirely conversant about language.* Even if reasoning could take place without any employment of language, such a process would not come within the province of logic. Language is employed for various purposes: by the historian, for informing; by the poet, for gratifying; by the orator, for persuading; and by the logician, for convincing.

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* Many of these technical terms will scarcely be met with again, but it is advisable to learn their meanings.

Terms are liable to be *indistinct* (*i.e.* without any clear, determinate meaning); *propositions*, to be *false*; and *arguments*, *inconclusive*.[*] Logic undertakes to guard against this last defect, and, in a certain degree, against the others also. In other words, logic enables us to frame rules decisive of the *reality* of a *term*, *proposition*, or *argument*, and, in the last case, this is everything. In a proposition, the *subject* is what is spoken of; the *predicate* is what is said of it. Logically, the *subject* is placed first, and the *predicate* last, these two *terms* (or extremes) being connected by the *copula* ("is" or "is not"), which indicates the act of judgment. The substantive-verb "to be" is the only verb recognized by Logic, all other verbs being resolvable into a part of this verb together with an adjective or participle. Further, the *present* tense of the verb "to be" is the only one recognized as *copula;* if any other tense occurs, the time must be incorporated into one of the terms; thus we must change "That man *was* honest" into "That man *is* one formerly-honest."

The verb "to be" is sometimes both copula and predicate, *e.g.* "One of Jacob's sons *is not*."

§ 3.

A *categorematic* word is one capable of being employed by itself as a term: hence no words are categorematic, except nouns in the nominative case. All other words, being able to form part only of a term, are *syncategorematic*. A *verb*, however, must be excluded from either class, since we have seen that a verb in general contains the copula as well as the predicate (or part of it). Hence verbs may be called *mixed* words.

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[*] Strictly speaking, an inconclusive argument is not an argument at all.

Here we do not include under the term "verb" either the Infinitive, which is properly a Noun-substantive, or the Participle, which is a Noun-adjective. (In English, the participle in *-ing* is frequently an *infinitive*, in which case, of course, it is a substantive, as "Rising early is healthful.")

In such a sentence as "It is to be hoped that we shall succeed," we see more clearly what parts are subject, copula and predicate, by transposing it into the form "That we shall succeed *is* to be hoped."

CHAPTER II.

Of Propositions.

§ 1.

A Proposition is a judgment expressed in words, or is defined logically as a *Sentence indicative*, by which it is distinguished from a Question, Command, Prayer, &c. It must not be ambiguous, since then it will not be indicative.

Propositions, considered merely as *sentences*,[*] are distinguished into "Categorical" and "Hypothetical."

The Categorical (κατηγορέω, to indicate) asserts simply that the predicate does, or does not, apply to the subject, as in all the examples hitherto given. The Hypothetical makes its assertion under a Condition ("If the world .., it must .. "), or with an Alternative ("Either mankind .., or .. "). These two sorts of Hypothetical propositions are called *conditional* and *disjunctive* respectively.[†] Categorical propositions are subdivided into the *pure*, in which a *simple* statement is made, and *modal*, in which the statement is qualified by some adverb or adverbial phrase; a distinction, than which, as Hamilton rightly says, nothing can be more futile.

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[*] For, sentences which are not propositions may be similarly divided; thus, "If music be the food of love, play on," and "Let us do, or die," are both Hypothetical.

[†] Hamilton interchanges the terms *hypothetical* and *conditional* here. Thomson avoids the quibble by dividing propositions at the outset into three classes: *categorical*, *hypothetical*, and *disjunctive*.

The preceding divison into Categorical and Hypothetical is said to be a division of propositions according to their *substance* (*i.e.* considered simply as *sentences*). Propositions are divided according to their *quality* into "affirmative" and "negative." [More strictly speaking, this division is according to the *quality of the expression*, while according to the *quality of the matter* they are divided into "true" and "false." Thus, by the word "matter," in logical works, is signified the degree of actual truth attaching to any proposition. It is clear that this does not concern the science of Logic (in which a statement must be assumed absolutely true in order to form a premiss), though it is of the greatest importance in other sciences.]*

Whether a proposition is affirmative or negative is decided by its copula. Thus, "Not to advance *is* to fall back," is affirmative; and "No miser is truly rich" [or, "Misers one and all *are not* truly rich,"] is negative.

There is yet another division of propositions, according to their *quantity* (or extent of the subject).

If the predicate is said of the whole of the subject, the proposition is *Universal;* if of part of it only, *Particular.* In other words, *universal* propositions are those in which the subject is distributed; *particular* propositions those in which it is not distributed.

Notice should be taken of the use of the word "all" or "every" in negative sentences. Thus, in "All tyrants are miserable," the subject is distributed, but in "All tyrants are not assassinated" (which really means "Some tyrants *are not* assassinated") the subject is undistributed, and the proposition is therefore *particular.*

We have thus in all four kinds of pure categorical propositions, which are designated for convenience by the first four vowels A, E, I, O.

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* Def. "The *matter* of a proposition is the *real* connexion between its terms in respect of their meaning." Hamilton remarks that "the division into *necessary*, *possible*, &c., proceeds upon a radical mistake of the nature and domain of Logic."

Thus propositions which are

Universal and Affirmative have the symbol A
Universal and Negative .... E
Particular and Affirmative I
Particular and Negative .... O[*]

§ 2.

When the subject of a proposition is a common-term, and is preceded by no word (such as "all," "some," &c.) to determine whether it is distributed or not, the proposition is said to be *indefinite*, and its quantity must be ascertained by the *matter*. That is to say, by observation, experience, or common-sense, we must settle whether the proposition is universal or particular. Until this is done, an indefinite proposition is of no avail for logical reasoning (except for such conclusions as may be derived from it by assuming it only particular). "It is a postulate of Logic, explicitly to state what has been implicitly thought."

Singular terms are always distributed, except in very rare and rather artificial cases, as "Non *omnis* moriar."

§ 3.

Of Opposition.

Propositions of any two of the forms A, E, I, O, having the same subject and predicate, are said to be *opposed*. Hence there are four kinds of opposition.

The two universals (A and E) are called *contraries* to each other.

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[*] By extending the doctrine of distribution to the predicate, denying that this is determined by the *quality* (affirmative or negative), Sir W. Hamilton divides propositions (or judgments) into the following eight kinds:

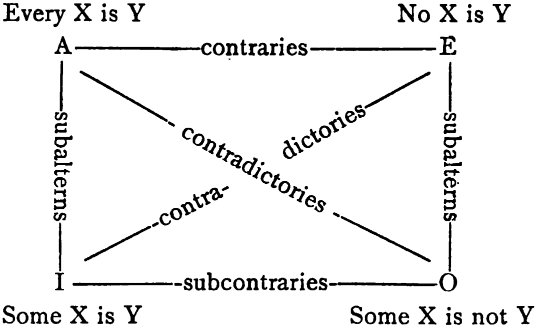
Sign.	Affirmatives.	Negatives.	Sign.
U	All X is all Y	No X is Y	E
I	Some X is some Y	Some X is not some Y	ω
A	All X is some Y	No X is some Y	η
Y	Some X is all Y	Some X is no Y	O

Of the four new ones Dr. Thomson retains U and Y only, as η and ω are practically useless.

The two particulars (I and O) are called *subcontraries*.

The two affirmatives (A and I) } are called *subalterns*.
The two negatives (E and O) }

The two pairs which contradict each other both in quantity and quality (A and O, E and I) are called *contradictories*.



Contradictory opposition is the most perfect.

For, that A is true or false, implies that O is false or true, respectively, and *vice versâ*. So with E and I. (Hence belief and disbelief are not two *different* states of mind).

Contraries cannot both be true, but may be both false.

Of subalterns the lower follows from the higher; thus I follows from A, and O from E.

Subcontraries contain no real contrariety, as, if one of them conveys the whole truth, the other follows of course. For if '*only some* X is Y,' it follows that 'some X is not Y.' They cannot both be false together. But really, in subcontraries, the subject is not the same in both cases, as different parts of the common-term are referred to. Hamilton calls them *congruent*.

§ 4.

Of Conversion.

Conversion consists in the transposition of subject and predicate. We will examine in what cases and with what limitations or alterations this can be done.

It is clear that when the subject and predicate are both distributed, or both undistributed, we may convert the proposition *simply* (without any alteration of *terms*).

Thus from "No virtuous man is a rebel," we infer immediately that "No rebel is a virtuous man," and from "Some boasters are cowards," we know that "Some cowards are boasters." These are instances of *illative* (which is the only *real*)* conversion, the truth of the converse being implied by the truth of the Exposita (or proposition given).†

Hence E and I may be both simply-converted, illatively. If in A the whole of the predicate *happens* to agree with the subject (in which case A becomes U), it may be simply converted, the terms in this case being called *convertible.* Thus conversion furnishes a test for the adequacy of a definition.

Now let us see with what alterations A and O may be converted in all cases.

From A, "All birds are animals," we may infer directly I, "Some animals are birds." The term "animals" has to be limited in quantity in the process of conversion. This is therefore called conversion *by limitation* (or technically, "*per accidens*").

It is clear that E *may* be thus converted also, if we choose to make a statement inferior to the exposita. (For, from "No X is Y" we *may* assert only that "Some Y is not X," although we have the power to assert that "No Y is X").

The only way of converting O is by considering the negative as attached to the predicate instead of to the copula, by which it comes under the class I, and can be simply converted. Thus, from "Some X is not Y" we get "Some not-Y is X;" from "Some who possess wealth are not happy" we get "Some who are not happy possess wealth," or freely, "One may possess wealth without being happy."

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* What in common discourse we call the Converse, is an instance of *apparent* or un-real conversion. Thus, in the 1st book of Euclid, the 6th Proposition is the converse of the 5th, though it cannot be immediately inferred from it, but requires a distinct proof.

† This conversion is called by Dr. Thomson "immediate inference," and is placed by him under the head of "Reasoning," while Whately asserts that it is not a process of reasoning.

This may be called conversion by *negation*, or by *contraposition*. It is clear that this is not a genuine conversion, since one of the terms is altered (as above, from "happy" to "not happy"). Yet the proposition will be *equipollent* (*i.e.* will convey the same meaning as before).

A also may be converted by *negation*, if we first change it to E by introducing two negatives.

Thus, A, "Every poet is a man of genius;"
Changed to E, "No poet *is* not-a-man-of-genius;"
Converted, E, "No man without genius is a poet."

Hence we may convert E and I simply,
.... A and E by limitation,
.... A and O by negation.

CHAPTER III.

Of Arguments.

§ 1.

We now come to the third and last of the operations of the mind which are concerned in Argument.

This is Reasoning, or, expressed in words, Argument itself; and an argument stated at full length and in regular form is a *syllogism*.

In an argument, the thing proved is called, beforehand, the *question;* afterwards, the *conclusion*. That which is used to prove it, if stated first, is called the *antecedent*, or *premisses;* if stated last, the *reason*.

Definitions. An *argument* is an expression in which, from something laid down and granted as true, something else beyond this must be admitted to be true. A *syllogism* is an argument so expressed, that the conclusiveness of it is manifest from the mere force of the expression (without considering the meaning of the terms).

An argument must either be perfectly valid, or else prove nothing at all. When people talk about an argument having *some* weight, they mean that they have not a complete faith in one or both of the premisses. The *conclusiveness* must be indisputable, one way or the other, though the *conclusion* may be doubtful.

The palpable falsity of a conclusion often reveals the falsity of one of the premisses. This constitutes what is known as the "*indirect*" mode of proof, employed in Mathematics and other sciences.

§ 2.

To avoid the tediousness of reducing all syllogisms to the exact form prescribed by Aristotle's Dictum, six Axioms have been framed as tests of validity of arguments, all of them depending on the two following Canons (or Axioms): "If two terms both agree with a third, they agree with each other," "If one only of two terms agrees with a third, the two do not agree with each other."

1. *Every syllogism has three, and only three terms.* These are the *subject* of the conclusion (called the *minor-term*), the *predicate* of the conclusion (called the *major-term*), and the *middle-term* (or medium of proof). If there were two middle-terms, they could not be eliminated, and no conclusion could be drawn.

2. Every syllogism has three, and only three propositions, viz. the *major-premiss* (containing the *major-term*), the *minor-premiss*, and the *conclusion*.

3. *The middle-term must be distributed in one, at least, of the premisses.* For otherwise one of the extremes* may have been compared with *one part* of it, and the other with *another part* of it. (Of course the middle-term must not be ambiguous, *i.e.* have more than one meaning given to it; nor may either of the other terms).

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* The major and minor terms together are called the *extremes*.

4. *No term must be distributed in the conclusion which was not distributed in its premiss.* This would constitute an "*illicit process,*" either of the major or the minor term.

5. *From two negative premisses nothing can be inferred.* For here there is no agreement of any sort.

6. *If one premiss is negative, the conclusion must be negative.* This is another way of stating our second Canon.

From these six rules we see that

1st. Nothing can be proved from two particular premisses.

2nd. If one of the premisses be particular, so must the conclusion be. Even if both be universal, we cannot always infer a universal conclusion.

The mnemonic lines containing the six rules are easily learnt; we give them here:

"Distribuas medium, nec quartus terminus adsit;
Utraque nec prœmissa negans, nec particularis;
Sectetur partem conclusio deteriorem,
Et non distribuat, nisi cum prœmissa, negetve."

Hamilton gives the following supreme Canon of categorical syllogism: Whatever worse relation of subject and predicate subsists between either of two terms and a common third term, with which one at least is positively related, that relation subsists between the two terms themselves.

§ 3.

Of Moods.

When we designate the three propositions of a syllogism by their symbolical letters, we determine the *mood* of the syllogism. Thus, we may speak of the mood AEO, &c.

The whole number of possible groups of 3, out of 4 letters, each of which may be taken 1, 2, or 3 times, is $4 \times 4 \times 4 = 64$. Thus there are 64 moods in all. But many of these are inadmissible, from violating some of the six rules. It is found that 11 moods only can be legitimately used. These may be extracted from the "*Barbara*" verses (for which see further on).

§ 4.

Of Figure.

The figure of a syllogism consists in the situation of the middle-term, with respect to the others.

Let the letters S, P, M, denote the subject and predicate of the conclusion, and the middle-term, respectively.

The *proper* order is to place the major premiss (containing P, the major term) first.

The *four* Figures are:

	1st Fig.	2nd Fig.	3rd Fig.	4th Fig.
Major-premiss	M P	P M	M P	P M
Minor-premiss	S M	S M	M S	M S
Conclusion	S P	S P	S P	S P

To assist in rembering these, in the right order, the following hieroglyphic is offered:

.\˙   :| |:   ˙/.

Here the bar gives the two positions of the middle-term in the two premisses; then we know that P comes in the first premiss, and S in the second.

Out of the 11 *moods* mentioned in the last section, it is found that each of the four figures will admit 6 (not the same 6 in all). But a few of these are useless, as they prove less than might be proved. The remainder are given by the vowels of all the words with capital letters in the following mnemonic hexameters:

Fig. 1. Barbara, Celarent, Darii, Ferio-que prioris.
Fig. 2. Cesare, Camestres, Festino, Baroko, secundæ.
Fig. 3. { tertia Darapti, Disamis, Datisi, Felapton,
Bokardo, Ferison habet; quart' insuper addit.
Fig. 4. Bramantip, Camenes, Dimaris, Fesapo, Fresison.

Thus, if we were asked to give an example of Felapton, we find, by repeating the lines, that Felapton is in the 3rd figure, and accordingly write down $\left\{\begin{array}{l} \text{M P} \\ \text{M S} \\ \text{S P} \end{array}\right.$

Now E is of the form "no X is Y"; therefore put down "no M is P": A is of the form "all X is Y"; therefore put down "all M is S": O is of the form "some X is not Y"; therefore put down "some S is not P."

We can now put any terms we choose for M, P, S, so long as they make the premiss correct. Thus, the syllogism may become, for instance,

"No Englishman has a black skin;
All Englishmen are free;
Therefore some free men have not black skins."

By a study of these menmonic lines, it is found that A can be *proved* only in the first figure, in which all four kinds of propositions can be proved; the 2nd figure proves only negatives, and the 3rd only particulars.

The four sorts of syllogisms in the 1st figure are the most natural, and most frequently used, and to these the *Dictum* can be immediately applied; while the 4th figure is hardly ever used, being little else than a clumsy way of expressing the 1st figure.

The 2nd figure is used for *disproving*, as is evident from the consideration that the conclusion is always negative; S is shewn to disagree with P, because one of them has, while the other has not, some attribute M. It is naturally used in the process called "Abscissio Infiniti," a system of proof by successive exclusions, so as gradually to narrow the range of possible suppositions.*

When the middle-term is singular, it *must* officiate as subject in both premisses, so that the 3rd figure must be used in this case. It is also naturally employed for establishing an *objection* (Enstasis of Aristotle) to an opponent's universal premiss by adducing some particular instance in which his statement is not true.

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* The sagacious dog, who, following his master at a great distance, and coming to a cross-road where there were three directions to choose from, is said to have sniffed along two of the three roads, and then gone along the third without sniffing at all, performed this act of reasoning.

Thus, to disprove the statement that no person who is deaf, dumb, and blind can be taught language, we argue thus, in the 3rd figure, Darapti:

"Laura Bridgman was taught language;
And she was deaf, dumb, and blind;
Therefore a person deaf, dumb, and blind has been taught language."

§ 5.

Ostensive Reduction.

The four moods of the 1st figure are called the *perfect* moods, and when a syllogism is brought into this form it is said to be *reduced* (*i.e.* to the 1st figure).

The whole art of Reduction depends on the laws of Conversion, for which see § 4, Chap. 2. No new terms or propositions may be introduced, but the premisses may be *illatively converted*, or *transposed* (*i.e.* have their characters of *minor* and *major* interchanged). If the premisses are converted only, the conclusion is the same as before; if they are transposed, of course the conclusion will be the converse of what it was before (for S and P will have changed places).

We now see the meaning of some of the consonants in the words contained in any of the "Barbara" lines except the first. Thus the letters *s* and *p* coming after a vowel shew that the proposition symbolized by that vowel must be converted, either *simply* or *per accidens*.

The initial letters B, C, D, F, shew to *which* mood of the first figure each of the others may be reduced, namely, to that one beginning with the same letter.

Thus, let the syllogism be Cesare:

E No mineral is organized,
A All plants are organized,
E Therefore no plants are minerals.

The letter *s* shews that the first (major) premiss has to be converted *simply*. Thus we get

E No organized being is a mineral,
A All plants are organized beings,
E Therefore no plants are minerals;

which is a syllogism in Celarent, of the 1st figure.

Let the syllogism be Darapti:

A All wits are dreaded,
A All wits are admired,
I Therefore some who are admired are dreaded.

The letter *p* shews that the second (minor) premiss has to be converted *per accidens* (by limitation) into "*Some* who are admired are wits." The syllogism now becomes Darii, of the 1st figure.

The letter *m* denotes that the premisses have to be transposed: Thus, let the syllogism be Camestres:

A Every plant is organized;
E No mineral is organized;
E Therefore no mineral is a plant.

The two letters *s* shew that the two E's have to be converted, and *m* shews that the premisses have to be transposed. Thus we get

E No organized being is a mineral,
A Every plant is organized,
E Therefore no plant is a mineral;

which is a syllogism in Celarent.

Whately next shews how Baroko and Bokardo may be *reduced*, by conversion of the major premiss *by negation*, together with other changes. These, however, are commonly treated by the method of the next section.

The above methods constitute Ostensive Reduction, so called because we get the *same* conclusion, or else its illative converse.

§ 6.

Reductio ad Impossibile.

This is also known as the *reductio ad absurdum*. As in some propositions in Euclid, we say that if our conclusion be not true, its *contradictory* must be true; then, combining this contradictory with one premiss of the original argument, we arrive, by the 1st figure, at a conclusion which contradicts the other original premiss.

For example, take a symbolical argument in Baroko:

All P is M,
Some S is not M,
Therefore some S is not P.

The contradictory of this conclusion is that "All S is P," which, combined with the major-premiss "All P is M," gives us the new conclusion "All S is M," which is seen to contradict the original minor-premiss "Some S is not M." Hence the contradictory of the original conclusion is false, or the conclusion itself is true.

The letter *k* (in Baroko and Bokardo) denotes that the proposition symbolized by the preceding vowel is the premiss to be at first omitted in the process just described.

The conversion of Bramantip may be specially noticed:

A All Ashantees are men,
A All men have noble instincts,
I Therefore some beings with noble instincts are Ashantees.

The letter *m* warns us to transpose the terms, which involves the conversion of the conclusion. The letter *p* is meant to shew that this conversion is to be *per accidens* in a retrograde manner, *i.e.* changing from particular to general, since the new premisses justify this. The syllogism is thus changed to Barbara.

In forming syllogisms of any specified sort, the student is recommended always to begin with the symbols S, P, M (which are far more suggestive than X, Y, Z), and when the required transformation has been effected, suitable concrete terms can be substituted for them.

PAPERS
SET AT THE COLLEGE MAY EXAMINATIONS, AT ST. JOHN'S COLLEGE.

1870.

1. SHEW that all reasoning can be analysed into a conclusion based upon two other propositions; and distinguish between a syllogism and an enthymeme.

2. What is meant by the "dictum de omni et nullo?" Prove that no argument is valid to which its principle is inapplicable. Refute any objections which have been brought against it on the ground (1) of its simplicity, (2) of its inadequate results.

3. What is an indefinite proposition? Distinguish between the terms "quantity" and "quality" of a proposition.

4. Define and illustrate, by examples, abstraction and generalization. How does Whately attempt to disprove the doctrine of "ideas?"

5. Define the following: a copula, a predicate, a categorematic, a syncategorematic, and a mixed word; and state the limitations assigned by Whately to the aim of Logic regarded as a science.

6. State what is meant by the distribution of terms; and shew how the distribution or non-distribution (1) of the subject depends upon the quantity of a proposition, (2) of the predicate upon its quality.

7. Determine the truth or falsity of subalterns and subcontraries (1) in impossible, (2) in contingent, matter, illustrating your answer by examples.

8. Enumerate the six principal rules by which a categorical syllogism must be tested.

9. Examine the validity of the following arguments:

(i) All great generals have been statesmen:
Wellington was a statesman:
Therefore Wellington was a great general.

(ii) All kings are sovereigns:
A duke is not a king:
Therefore a duke is not a sovereign.

(iii) Some kings are absolute:
Some dukes are not absolute:
Therefore some dukes are not kings.

10. Define the mood and figure of a syllogism. Enumerate the moods which can be used in a valid syllogism. To what mood and figure do the following syllogisms belong?

(i) No traitor is a good citizen:
A false friend is a traitor:
Therefore no false friend is a good citizen.

(ii) A false friend is a bad citizen:
A bad citizen is a traitor:
Therefore some traitors are false friends.

11. Given a major term "vicious," a minor term "wise," and a middle-term "philosophers," construct a syllogism (1) in Cesare, (2) in Feriso.

1871.

1. What is Whately's definition of Logic? Criticise it, (*a*) from Halilton's point of view, (*b*) from Mill's.

2. Give a brief analysis of the syllogism, explaining the principal terms employed.

3. What is the "dictum de omni et nullo?" Examine its claims to be regarded as the fundamental axiom of ratiocination.

4. Explain the processes of *abstraction* and *generalization*. Can there be abstraction without generalization?

5. Explain the terms: *enthymeme, syncategorematic, distribution.*

6. When are two propositions said to be *opposed* to one another? Give a table of the various kinds of opposition.

7. What is *conversion?* Give examples of the various kinds.

8. Define the *mood* and the *figure* of a syllogism. Why is there a difference between the number of actual and that of possible moods?

9. Explain and illustrate: "*camestres* is reduced to *celarent* by simply converting the minor and then transposing the premises."

1872.

1. Logic is the Science of the necessary Laws of Thought.

Logic is the Science of the operations of the understanding which are subservient to the estimation of evidence.

Compare each of these definitions with Whately's.

A writer who accepts the first definition criticizes the second as "too wide for scientific accuracy:" explain this objection.

2. Distinguish between Categorematic and Syncategorematic words, between Categorical and Hypothetical Propositions, and between the direct and indirect modes of proof.

3. B. Really, all work is pleasant after this plethora of amusement.
C. It is a matter of taste: in my opinion no work is pleasant.
D. That is too sweeping—some work is.
F. Quite sure I am that some is not.

Neglecting the adverbs and expletive phrases, say how a logician would describe the relations existing between the several statements of these four interlocutors.

4. What is the peculiar difficulty encountered in the conversion of the proposition O? How is it to be met?

5. State the maxim known as the "*dictum de omni et nullo*." Upon what grounds is it rejected by Mill? State briefly his view of the foundation of the syllogistic process.

6. State the reasons for rejecting the moods of syllogism represented by the following symbols: AEA, AIE, EIE, OIO, EEA.

7. Construct original concrete examples of Camestres, Baroko, Disamis, Bramantip, and reduce them to the first figure, explaining carefully in each case in what way the various letters in the words guide you in the process of reduction.

8. Explain the terms *Petitio Principii*, *Ignoratio Elenchi*, and *Argumentum ad hominem*.

Give examples of (*a*) Undistributed Middle, (*b*) Illicit process of the Major Term, (*c*) Illicit process of the Minor Term.

9. Express the following arguments in simple and complete logical form: test the validity of each, and give the exact name of the argument or fallacy which is exemplified:

(*a*) Gold and silver are wealth; and therefore the diminution of the gold and silver in the country by exportation is the diminution of the wealth of the country.

(*b*) Who is most hungry eats most; who eats least is most hungry; therefore who eats least eats most.

(*c*) The express train alone does not stop at this station; as the last train did not stop it must have been the express train.

10. Giving the definitions of Logic and of Grammar which you accept, investigate the relations between the two sciences.

1873.

1. How does Whately distinguish between an art and a science? Can you offer any criticism on the distinction as laid down by him?

How does he determine the genus of Logic?

2. Explain what is meant by the quantity and quality of propositions. How are the differences between propositions as to quantity and quality symbolically represented?

3. When are propositions said to be opposed? Describe in logical terms the relations existing between each possible pair of the four following propositions:

All, who have not been convicted, may vote.
Some may not vote, who have not been convicted.
None, who have not been convicted, may vote.
Some, who have not been convicted, may vote.

4. Give original examples of the three kinds of conversion. Why do mathematicians give a distinct proof of each of the following propositions?

All equilateral triangles are equiangular,
All equiangular triangles are equilateral.

5. Upon what grounds does Whately argue that 'a single premiss is not sufficient to warrant a conclusion'?

Compare his view with that of Thomson.

6. State clearly Whately's view of the true foundation of reasoning.

Give Mill's criticism of his position.

7. Why are the syllogisms represented by the following symbols invalid?

AOA, EOO, EEO, AIO.

8. Give examples of Cesare Bokardo Camenes, not using letters for terms. Explain such letters in the three words as have meaning, and illustrate their use

by the reduction of each of the three syllogisms to the first figure.

Upon what grounds has the process of Reduction been rejected by some logicians?

9. Shew how the non-distribution of the middle Term affects the Validity of a syllogism, and explain the nature of the two kinds of Illicit Process, giving examples of your own.

10. State the following in a syllogistic form, and determine the mood and figure in each case, at the same time testing the soundness of the reasoning:

(*a*) Every one desires happiness: virtue is happiness: therefore every one desires virtue.

(*b*) Of the two evils the less is to be preferred: occasional turbulence, therefore, being a less evil than rigid despotism, is to be preferred to it.